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BUREAU OF PLANT INDUSTRY—BULLETIN NO. 184.

B. T. GALLOWAY, *Chief of Bureau.*

THE PRODUCTION OF VEGETABLE SEEDS:

SWEET CORN AND GARDEN PEAS AND BEANS.

BY

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Plant Industry,
Office of the Chief,
Washington, D. C., April 15, 1910.

Sir: I have the honor to transmit herewith a manuscript entitled "The Production of Vegetable Seeds: Sweet Corn and Garden Peas and Beans," by Dr. W. W. Tracy, Superintendent of Vegetable-Testing Gardens, Horticultural Investigations, and recommend that it be published as Bulletin No. 184 of the special series of this Bureau.

Doctor Tracy is recognized by the American seed trade as an authority on all matters relating to the nomenclature, growing, harvesting, and handling of vegetable seeds. This paper is based on the author's personal experience in this field of activity.

Respectfully,

B. T. Galloway,
Chief of Bureau.

Hon. James Wilson,
Secretary of Agriculture.

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B. P. I.—576.

THE PRODUCTION OF VEGETABLE SEEDS: SWEET CORN AND GARDEN PEAS AND BEANS.

INTRODUCTION.

Among the many changes in the art and practice of American agriculture which have developed since the organization of the Department of Agriculture, none has been of greater practical importance than those connected with the growing and handling of seed of garden vegetables. Since that time there has been a marvelous increase in the quantity of seed used in this country. One of the largest of the nearly one thousand seed firms now doing business in the United States uses buildings with an aggregate floor surface of more than 16 acres, and more than half of this is in two adjacent buildings. This space is more than that occupied by the entire seed trade of the country only fifty years ago. Not only has there been an enormous increase in the quantity of seed used, but a great improvement in the quality.

One of the most encouraging developments in the growing of garden vegetables is the increasing recognition of the practical importance of using pure and uniform stocks of seed whose varietal characteristics adapt them to distinct local conditions and market requirements. The advantage of the use of superior seed can only become available to planters through the growing of strains which are uniformly of the exact varietal character wanted.

The immense quantity of seed necessary to supply the ever-increasing demand makes it practically impossible for the seedsman to grow on his own farm all of the seed he handles, and he is obliged to have the major portion of it grown for him by others. This condition makes the growing of seed crops of sweet corn, garden peas, or beans, which would necessitate no radical change in farm practice or material increase in farm equipment, well worthy of the attention of farmers who are located where soil and climatic conditions are favorable for the best development of these vegetables.

PRESENT CONDITIONS AND PRACTICES IN VEGETABLE SEED GROWING.

Nearly all of the seed of sweet corn, garden peas, and beans used in America is grown under contract between farmers and seedsmen. The contract usually provides that the farmer shall devote a certain area of suitable land to the production of the seed crop. He further agrees to properly prepare the land, plant it with seed acceptable to the seedsman, and cultivate, harvest, care for, and clean the crop in such a way as to secure the largest return of seed fit for seedsmen's use that can be obtained through good farm practices and the use of ordinary farm machinery, as well as to deliver the entire resulting seed product to the contracting seedsman on or before a certain date.

The seedsman, on his part, agrees to furnish the seed needed for planting the area specified and to pay an agreed price per pound or bushel for all the seed in excess of the amount furnished for planting which the farmer is able to produce on that area and to deliver in such condition that it is suitable or without an unreasonable amount of recleaning can be made fit for seedsmen's use.

Under another form of contract the farmer agrees to provide a certain area of properly prepared land and, acting under the directions of the seedsman and as his agent, to plant it with the seed furnished and to cultivate, harvest, and cure the crop so as to secure the largest return of clean and highly viable seed that can be secured by good farm practice and the use of ordinary farm machinery, it being understood and agreed that the stock seed furnished and the seed crop produced from it are, and are to remain, the property of the contracting seedsman. The seedsman agrees to pay the farmer, for the rent of the land and for the labor of growing and harvesting the seed crop, a specific amount for every pound of seed which he may grow and deliver in accordance with the agreement. Under such contracts the farmer acts simply in the capacity of a cultivator, handling the crop as he would if it were grown for sale as grain, except that he is called upon to locate and handle it so that the seed will be satisfactorily free from danger of mixture with other plantings of the same species.

In some cases the growing contracts, especially those for peas and beans, provide that the farmer shall "rogue out" or destroy any plants that seem to be of a different variety or of noticeably inferior quality, but such "roguing" is seldom actually done by the farmer, and if done at all it is under the immediate direction and at the expense of the contracting seedsman. Many seedsmen employ large gangs of men to go over seed crops grown for them and remove as many as possible of the "rogue" plants.

ELEMENTS OF VALUE IN GARDEN SEEDS.

Seedsmen usually contract for the growing of their supplies of seed of sweet corn, peas, and beans instead of depending upon purchase by sample in the open market, because the elements of value in the case of seeds are different, at least as to their relative importance, from those in the case of most merchandise.

Appearance.—The good appearance of the seed as to cleanliness, size, plumpness, and color of the grain is a most desirable quality and, in most instances, one easily recognized, but one which is often misleading as to comparative value. An illustration is the case of Red Valentine beans, in which a plump, full, symmetrical bean of a bright red color is apt to go with inferior varietal quality, while a twisted, unsymmetrical shape and a dull color are generally indications of a pure and true stock of the sort.

Purity of varietal character can rarely be determined by even the most critical examination of the sample, and though viability can be readily ascertained by germinative tests it requires some days to make these, so that the appearance of the seed gives little indication of its comparative value.

Viability.—That every grain will under favorable conditions develop into a healthy plant would be regarded by many, particularly by those of little horticultural experience, as the most important of all qualities, and in the case of a single seed viability is essential to its value. However, of two lots of seed, in one of which 60 to 75 per cent of the grains will develop into plants which are typical of the variety, while the remainder will not germinate at all, and in the other, though every seed is viable, only 10 or 20 per cent of them will produce typical plants of the sort, the others developing into a medley of different forms and qualities, the first lot, though only 60 to 75 per cent viable, is decidedly the most satisfactory and valuable.

Stock.—Purity and evenness of varietal character are the most important factors in determining the real value of seed. A seed is essentially a plant packed for transportation, and carries within itself the potentialities and limitations of development of the plant into which it may grow. With the aid of climate and soil and through the control of cultural conditions man may secure more or less perfect expression of these potentialities, but he can not add to or change them; they were predetermined by the varietal characteristics of the producing plant and its ancestors. In a few exceptional cases such inherent varietal character is more or less clearly indicated by visible peculiarities of the seed, but generally such indications are neither readily discernible nor reliable, and one can only know the varietal character of the plant any given seed will develop into by having far

more knowledge of the producing plant and its ancestors than is to be gained from the appearance of the seed itself.

Relative supply and demand.—The commercial value of all kinds of seed is dependent, even to a greater degree than is the case with most merchandise, upon relatively temporary supply and demand. A shortage of seed can not usually be met with a fresh supply until the next season, and the forcing upon the market of even a small surplus has a more depressing effect than with most merchandise. As most seeds retain their vitality for several years seedsmen usually guard against a short crop by carrying over a portion of the previous season's growth, but this carrying over of a large proportion of one's stock is objectionable not only because of the cost of storage, insurance, etc., but because of the prejudice, which in many cases is quite unjustifiable, in favor of "fresh" seed, and also because of the depressing effect which the putting upon the market of even a little more seed than is actually needed has upon current prices.

A wise seedsman will therefore not only hesitate to risk his reputation for handling pure and true stocks through purchase by sample, no matter how good the sample may seem to be, but will endeavor to limit his supply to seed which he knows was grown from pure and true stock seed, and as far as possible to that which was subject while growing to his own inspection and approval. He will also discourage the growing of speculative crops with the intention of selling by sample because of the liability of such crops to disturb the most profitable balance of supply and demand.

LOW PRICES FOR GROWING SEED CROPS.

Seedsmen are often able to place contracts for growing seed, particularly of sweet corn, peas, and beans, at very low prices—even lower than grain of the same species can be sold for on the market. That they are able to do so is the result of the following conditions:

(1) Though it is true that certain conditions of soil and climate are essential to profitable seed growing, lands fulfilling these conditions are so widely distributed and their total area is so much greater than is necessary for the production of all the seed needed that their possession and use for seed growing by no means insure a profitable crop.

(2) The growing of a seed crop for a widely advertised seed firm seems to many people more attractive than the growing of grain for sale in the open market, and farmers of this class are so numerous and are often so eager to get a seed contract that, through the influence of relative supply and demand in determining values, they lessen the price the seedsman has to pay.

(3) A seed crop which can not readily be sold in the open market or used by driblets, but must be delivered at a specified time and place, has advantages as a crop on farms worked on share rentals.

(4) Crops of seed beans and peas requiring comparatively little hand labor early in the season are well suited for taking the place of those which have been killed out by the winter. Under such circumstances, the fact that the seed planted, which amounts to from 10 to 25 per cent of the cost of the crop, is advanced by the contracting seedsman often makes a crop of seed beans or peas grown on contract a most convenient one.

"*Get-away*" *crops.*—Another factor in lowering the prices to the farmer is the use for seed of the "get-away" crops of canners and truckers. Canners endeavor to arrange the time of planting of the crops which are grown for them so that they will be able to care for each one when it is in prime condition, but from various causes they are sometimes unable to handle all of their crops at the proper time, and some of them become too mature for canning. Often the only available use of such "get-away" crops is as seed, and they are sold as such, and being in the nature of salvage the canners are glad to dispose of them at any price they can get. Occasionally truckers' crops are disposed of in a similar way.

Seedsmen do not advertise their use of "get-away" crops, many of them claiming that they never use such crops, but many carloads of this kind of seed are sold every year, and a part of it gets into the hands of some of our most reputable seedsmen. This practice can not fail to have a "bearish" effect upon the price paid for growing special seed crops.

POSSIBLE IMPROVEMENTS IN PRACTICE.

Seed crops are frequently grown by farmers who have little knowledge, ability, or liking for the work, and often only because the seed needed for planting a certain area is advanced to them or because for some other reason it is more convenient for them to plant a seed crop than any of those commonly grown on the farm. It is evident that under such circumstances actual seed growing would not drift into the hands of the best farmers, nor seed crops be sufficiently popular to secure the best care from those who do plant them. Few farmers who grow seed crops continue to do so for as many as a dozen consecutive years, and seedsmen are obliged to change frequently the centers from which they place their contracts in order to secure growers willing to undertake them. It is evident that present conditions are by no means such as would tend to the production of seed of the best quality or make seed growing profitable to the farmer, but the

writer believes that they may be greatly improved, and to the advantage of both seedsman and farmer.

There are several possible improvements in the practice of vegetable-seed growing.

(1) Seed growers, dealers, and planters need to change their belief and practices regarding the relative importance of "sample" and "stock."[a] In many cases purchasers will choose the better looking of two samples of seed at a higher price, although they know nothing of the stock from which it was grown except that it is said to be of the variety named, rather than the poorer looking sample, which though quite possibly of lower viability, is known to have been grown from well-bred stock seed. Seedsmen should emphasize far more than they do, through their salesmen, catalogues, and price lists, the superior value of seed produced from stocks which are known to have been carefully bred to a certain distinct varietal character. They should refuse to handle seeds which they do not know were grown from pure and true stocks. Planters should not be tempted by low prices to purchase seed of unknown or uncertain quality, but should always buy that which they believe to be the purest and truest stock, paying comparatively little attention to appearance, or even to viability.

(2) The seedsman should change his attitude toward the contracting farmer, looking upon him as a seed grower rather than as a mere cultivator and making every effort to increase his interest in and knowledge of the varietal character of the sort of seed he grows, as well as the special cultural methods which will best develop its distinguishing merits. This would necessitate the seedsman's making a greater effort to place his growing contracts not only with cultivators who are favorably situated as to climate and soil for growing certain seeds but with those who are likely to continue to grow seeds and by a better knowledge of their cultural requirements secure greater uniformity and stability. In order to induce such men to plant seed crops it might be necessary to pay better prices for growing, but this would be more than balanced, even financially, by the elimination of careless and incompetent growers who are apt to fail to deliver the expected crop and through whose negligence carefully selected stocks are often lost. The advantage accruing from a clientage of experienced and careful growers interested in the varietal characteristics of the stocks they grow and who by greater care and better cultural methods would grow not only better seed but in more

[a] Seedsmen commonly use the word "sample" as referring to the viability, color, and appearance of a lot of seed, and the term "stock" as referring to the quality, purity, and evenness of type resulting from the line of breeding and ancestry.

uniform quantities, thus lessening the liability to alternating periods of scarcity and surplus, would more than offset the higher price paid the farmer.

(3) There is a possibility of great improvement on the part of the farmer grower through more careful study not only of the particular crop but of the variety best adapted to his own conditions of soil and climate and of the cultural method which will give him the greatest certainty of a crop that shall be bright, clean, highly viable, and best suited for seedsmen's use. Many cases are known where two crops from the same stock seed were grown on adjacent farms by men who were considered equally good cultivators and one crop was clean, viable, and thoroughly satisfactory for use as seed while the other, solely because of difference in handling, was so discolored and lacking in viability that it was worthless for seedsmen's use.

Farmers seldom appreciate the importance to the seedsman of receiving the full quantity of seed contracted for. This in some cases is so great as to justify seedsmen when dealing with a professional seed grower in making an advance of from 10 to 50 per cent in price for a guaranteed delivery of the full amount of the contract. We may question the wisdom of making a guarantee of this kind, but the fact that such prices are paid shows how important and valuable the seedsman regards the careful handling of the crop so as to secure the expected return of usable seed.

(4) There is a possibility of great improvement through the use of better stock seed. A considerable proportion of the seed now grown, even for the most careful of our seedsmen, is in reality the product of the general crop rather than of selected stock seed. Most farmers, and even many seedsmen, fail to adequately appreciate the practical importance of absolute uniformity of stock and that such uniformity can only be secured by the use of stock seed which was not only the product of plants of the exact varietal character desired but which had behind it the greatest possible number of generations of just such plants.

The seedsman and farmer should come to a very clear understanding as to the exact form wanted in each variety. This should be established by samples, photographs, and full varietal descriptions, and it should be rigidly adhered to in selecting stock seed. An interested and intelligent farmer grower who confines his seed crop to a single variety of a species is in a better position to select stock seed, and is able to do it better and cheaper than a seedsman, and he should be fully advised as to the exact varietal character wanted and instructed to grow a sufficiency of the best possible stock for his own crops, if nothing more.

The cultural methods which will give the best returns with grain crops are generally equally well adapted to the growing of a crop for seed, but with the latter it is important that special care be taken that the seed be pure and that the percentage of viability is high. The best methods for securing crops of such seed will vary with different species and may be considered separately.

THE GROWING OF SWEET CORN FOR SEED.

The use of sweet corn, at least of the quality and in the quantities now common, is comparatively modern. Seedsmen handled very little sweet corn previous to 1825 or 1830, and for the next twenty or twenty-five years practically all of the seed used came from New England. In later years the growing of sweet-corn seed gradually extended into western New York, northern Ohio, Michigan, Iowa, and Nebraska, until at present fully 80 per cent of the sweet-corn seed produced in the United States is grown at points west and north of Cleveland, Ohio. South of the latitude of that city sweet corn is so liable to injury from the bollworm that it can seldom be profitably grown for seed.

INFLUENCE OF LOCATION ON SWEET CORN FOR SEED.

The corn plant is influenced as to size of stalk and earliness of maturity by climatic conditions, and this effect is transmitted through the seed, so it is desirable that seed of sorts in which earliness is an important element of value should be grown as far north as it can be fully ripened and cured.

The qualities of sweetness and tenderness in green corn are also influenced by soil and climatic conditions, but there is a difference of opinion as to how far this influence is carried in the seed. The corn packers of Maine insist that green corn grown in the North from northern-grown seed is superior to that which can be produced from seed grown farther south. The Maryland packers insist that they can get not only more but sweeter and more tender corn from seed grown in their own locality. In both cases the superior results obtained from local-grown seed may be accounted for by the fact that seed grown in any locality for a number of generations has been found by experimentation to give better results in that locality than seed of the same stock equally well grown elsewhere.

The belief that the use of northern and eastern grown seed will result in better and sweeter green corn is so general that seedsmen's catalogues are often so worded as to give the impression that all the sweet corn they offer is grown in the East, but very often seed bought of an eastern seedsman and supposed to be eastern grown was actually produced in the West. There are many facts that

seem to indicate that the gardener's prejudice against western seed is well founded.

If a field of sweet corn is planted with two lots of seed of the same variety, one eastern and the other western grown, and ears as uniform as possible as to maturity and quality are gathered from the two parts of the field, processed, and canned in the same way, experts can with a fair degree of certainty decide which lot of seed the corn in different cans was grown from, and they will generally declare that the corn from the eastern-grown seed is the better.

This difference in quality is much more noticeable in the earlier than in the later maturing sorts and with some lots of seed than with others. The belief that it actually exists is so general that it affects the relative market value both of canned corn and of sweet-corn seed. If we carefully select ears grown from eastern and from western seed which are in exactly the same stage of maturity, chemical analysis fails to detect any constant difference in sugar content. There is, however, a slight but discernible difference in the size of chit, or germ, and in a general way the green corn from western seed is slightly coarser in texture and less tender than that from eastern seed. The difference in quality may be accounted for as follows:

The climatic conditions in the western corn-growing sections, especially during the season when corn is earing, are often such as to induce a marvelously rapid development—much more rapid than is often seen in the East. In the West it is sometimes difficult to find ears of sweet corn green enough to be in prime boiling condition in fields where it was equally difficult to find ears which were mature enough to be palatable forty-eight to seventy-two hours earlier. Seed grown under such conditions would often transmit the rapid-maturing habit of the plants that produce it. The quality of green corn, particularly as to tenderness and sweetness, is very dependent upon the stage of maturity at which it is cooked, sometimes the growth of only a few hours affecting the discernible sugar content. If the corn in a field from western seed in which the rapid-maturing habit was transmitted was gathered for canning when most of the ears were in prime green-corn condition, some of the ears would be so mature as to lower the average quality of the pack, but it would be impracticable to reject such slightly overmature ears, and the resulting poor quality of the pack would be charged to generally inferior stock rather than to the effect of the few older ears.

One indication that rapid development, with the consequent short period of prime canning condition, is an important, if not the chief, objection to western-grown seed, is the fact that experienced canners who insist upon eastern-grown seed of the earlier sorts, like Crosby,

do not seriously object to well-grown western seed of the later and slower maturing sorts, like Evergreen and Country Gentleman.

Whatever may be the facts as to the relative merits of eastern and western grown seed, the writer believes that it is always true that the character of green corn is more or less affected by that of the soil on which the seed was grown. Seed grown in moderately rich but warm, well-drained, gravelly soils, like those common in Connecticut, New York, Ohio, Michigan, Wisconsin, and some sections of Iowa, Nebraska, and Minnesota, will give better and sweeter corn than seed grown on very rich mucky or prairie soils which would give large crops of field corn. It appears to be impossible to grow on a cold, heavy clay soil sweet-corn seed which will produce green corn of the highest quality.

CROSS-POLLINATION.

The location and character of soil are of less importance in the production of seed corn from which the best results may be expected than that the fields be so situated as to avoid as far as possible liability to mixture through the pollen. This is a far more common cause of inferior quality than is generally supposed. Seed growers object to growing Black Mexican corn because they say it crosses so freely with other sorts. There is no evidence, however, that this variety crosses more readily than others, but when crosses of Black Mexican and other varieties do occur the effects are more readily seen. Instances are known where Moore's Concord was evidently crossed with Black Mexican corn growing nearly two miles away; but in another case, where the Black Mexican and the Moore's Concord varieties were planted side by side on the same day, there was no indication of mixture beyond the sixth row from the dividing line.

Corn pollen in abundance has been obtained from the plumage of a blackbird, which must have flown between 4 and 6 miles from the last field of corn visited, and doubtless others of the large flock to which the bird belonged carried equal quantities of pollen, more or less of which they must have scattered in the field of seed sweet corn in which they alighted.

Difference in season of maturity is not always a protection against crossing. The writer knows of a case in which there was clear evidence of mixture in both directions between Extra Early Red Cory and Stowell's Evergreen corn growing side by side, although the Cory was planted some days before the Evergreen, but in another instance there was no sign of mixture between the Cory and the Black Mexican varieties planted side by side on the same day, all of the silk and the tassels of the Cory being ripe and dry before even the earliest tassel appeared on the Black Mexican, and in this case

there were no late-blooming suckers on the Cory to furnish pollen for the earliest Black Mexican plants.

In another instance, where two sorts of corn were separated by a thick grove of tall trees about 4 rods wide, there was no sign of mixture, but just beyond the grove, where the lots of corn were separated by an equal width of grass land, there was abundant evidence of crossing.

In another case, where two sorts were separated by a thick osage hedge not over 12 feet high, there was no indication of crossing within 8 or 10 rods of the hedge, while beyond that distance there were many crosses.

Experience shows that neither a distance less than several miles nor any varietial difference can be relied upon as a certain protection against a mixture of pollen. In most farming regions it is impracticable to locate a field of seed corn so as to guarantee that there shall be no mixture through pollen, though much can be done to lessen the probability of a mixture. How this may be best accomplished is a different problem in each case. Usually the most practical way is to plant each lot of seed as far as possible from any other corn, and also to have as much difference as possible in the dates of ripening of the seed corn and of the corn in the nearest field.

Fortunately, the effect of crossing in corn is rarely masked for a number of generations, as it often is in leguminous plants. It frequently shows so plainly in the grain which is the immediate result of the cross that much of the hybrid corn can be removed by careful sorting before shelling, and it is well to throw out the whole ear rather than to pick out the mixed grain, as is the common practice, because crossing does not always change the appearance of the grain the first season, and there is a strong probability that on an ear on which crossed grains are visible there are other crossed grains which show no external sign of mixture.

CULTURAL METHODS FOR THE PRODUCTION OF SWEET CORN FOR SEED.

In a general way the fertilization and preparation of the soil and the methods of culture which will give the best results with field corn will be equally effective with sweet corn, but because of liability to crossing with volunteer plants it is important that a crop for seed corn should not follow one of any other variety of corn and that care should be taken to prevent bringing into the field viable grains of corn and spores of corn smut or other corn diseases in stable manure or by stock.

Sweet-corn seed is usually of lower vitality than that of field sorts, and planting should be delayed until the soil is well prepared, warm,

and dry, special care being taken that the seed is not covered too deep. The small-growing, extra-early sorts, like Cory, Crosby, etc., may be planted in drills as close as 3 feet apart or in hills 3 feet apart each way and so as to secure from four to eight plants to the yard of drill or three or four plants to the hill.

The stronger growing sorts, like Evergreen and Country Gentleman, partly because of their greater liability to abundant suckering, need even more room than most varieties of field corn and should be planted in drills 42 to 60 inches apart or in hills the same distance from each other and so as to secure two or three stalks to the hill or to the yard of drill. Experience has demonstrated that with seed sweet corn equally large yields and better matured seed can be obtained from a somewhat thinner stand than would give the largest yield of field corn.

HARVESTING.

The value of seed corn, especially sweet corn, is largely dependent on the way it is gathered and cured. The average American farmer has drifted into such careless methods of handling corn that it is hard for him to recognize and use the care necessary for the production of good seed. The crop should be harvested as soon as the grain has fully passed into the dough state. The stalks should be cut and put into small shocks, but seed sweet corn can very rarely be well cured in shocks, no matter how small or how carefully they may be set up.

As soon after cutting as the stalks are well wilted, which will usually be in from three to six days, the corn should be husked and put into the drying cribs. It is important, especially with the short-stalked early sorts, that this be done promptly. If allowed to stand long in the shock the stalks will settle so that the ears are likely to come in contact with the soil and the grain be injured in appearance and viability.

Some growers, particularly those of Connecticut and Ohio, do not put the stalks into shocks, but go through and "top" or remove the part above the ear, and sometimes slip down the husk so as to fully expose the grain to the sun and wind, when it will dry out very rapidly and perfectly and can be gathered from the standing stalk. A disadvantage of this method is that if such "stripped" corn is exposed to even a slight frost before it is quite dry its viability as well as its vitality is lessened, often entirely destroyed.

In the Western States there is usually so little rain and such high dry winds are prevalent during the autumn months that harvesting can often be safely delayed until the corn is nearly cured in the field on the still standing stalks, and then the corn can be gathered directly

into large cribs to complete the drying; but even here early husking and cribbing are desirable.

The best way to handle sweet corn in the field is to husk into baskets or crates, as there is liability to serious injury by dirt, showers, or breaking of the skin if the ears are thrown on the ground or into a wagon, and if this occurs while some of the grains are still in the milk they will become discolored and so injure the appearance of the lot of seed as to render it unsalable.

CURING AND DRYING.

The essentials to the proper curing of sweet corn are that each and every ear shall be exposed to circulating air until the grain is per-

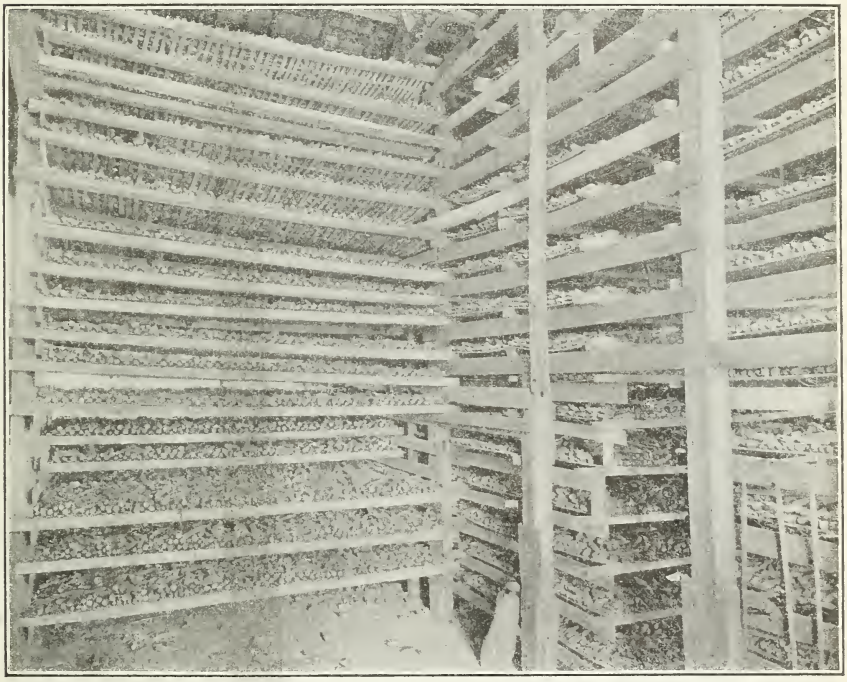

FIG. 1.—Ears of sweet corn on drying racks.

fectly dry and that this be accomplished without exposure, even for a few hours, to a temperature below 34° or 36° F. The vitality of green corn while it is still in the milk or dough state will be destroyed by long exposure to a low temperature, even if it be one several degrees above the freezing point, but as the grain matures and dries out it will endure lower temperatures without serious injury,

although long exposure to temperatures much below 32° F. lessens its vitality.

One of the best and safest ways to cure seed corn is that commonly practiced by the New England growers, the corn being spread in open sheds or barns on scaffolds formed of rails or slats so placed as to allow the air to pass freely between them. The corn should be spread very thinly at first—not more than two or three ears deep—or, better still, in a single layer, but it may be piled deeper as it dries out, care being taken not to do this until the corn is so dry that it will not mold. (See fig. 1.)

FIG. 2.—Ears of sweet corn on drying sticks.

A second method of curing seed corn is by the use of drying sticks about 1 by 2 or 3 inches and about 4 feet long. Old fence pickets are often used for this purpose. They are prepared as follows: Bore a half-inch hole about 2 inches from the end, and drive into each of the four sides of the stick, about 3 inches apart, a series of eightpenny or tenpenny round-headed wire nails, so that they will enter the wood about ¾ inch and project at a uniform angle of between 15 and 20° toward the end of the stick having the hole. On each nail jam the butt of an ear of corn so that the ears stand out in four directions from the sticks, which should then be hung on nails in the rafters of a low, open shed or on scantling placed at proper distances apart in such a building as a tobacco shed. It takes some time to stick the ears on the nails, but when this is done the corn can be well cured with little further attention. (See fig. 2.)

A third method is to husk into lath crates holding from 1 to 2 bushels of ears, and stack these crates either in the field, well protected from rain, or on the floor of barns where there is a full circulation of air. In either case the crates should be so stacked that the wind can pass freely through and between them.

A fourth method, requiring fewer special facilities but greater care, is to put the corn into rail or slat cribs built quite open and not over 20 to 30 inches wide at the bottom, but wider at the top. In filling these cribs, spread the corn to a depth of from 12 to 18 inches, and then place a series of slats about 2 feet apart across the crib and just above though not resting on the corn, being fully supported by the sides of the crib. Fill in 12 to 18 inches of corn above these

slats; then place a second layer of slats in the same way, but so as to break joints with the first layer, and repeat until the crib is full.

These slats are to prevent the corn settling together so as to hinder the free access of air. The cobs of sweet corn are not so stiff as those of the field varieties, and if green or partially dried ears are piled without support they will, even in a very narrow crib, settle together so as to prevent thorough drying.

Seed sweet corn can be cured so as to obtain a fine crop of high viability by any of the preceding or similar methods, but it is essential that the work be done promptly, so as to take advantage of bright weather and secure the thorough drying out of the corn before it is exposed to continuous damp or freezing weather. It is rarely possible to secure a good lot of seed of high viability if the work of curing is delayed until after the season when favorable weather conditions can be expected.

It is possible to cure corn by artificial heat, but this requires the most skillful use of warmed—not hot—air, kept in constant motion. Even with these precautions there is always a liability of the corn being ruined for seed purposes by mold, rot, or overheating, and for these reasons the method is not recommended.

As soon as the corn is perfectly dry it may be shelled, though it will generally keep much better on the cob. In a temperature below freezing, corn, either on the ear or shelled, will seem to be dry when it is not. Before shelling, it is therefore well to make a test sample of a quart or more, composed of a few grains from a great number of representative ears. If this, after standing for a day or two in a temperature considerably above freezing, becomes soft and damp, the shelling should be delayed until the corn is quite dry.

Well-cured corn is easily shelled by machine, by flails, or by hand, and the grain should be immediately run through a fanning mill, when it may be sacked, but it should be closely watched, and if it does not remain perfectly dry in a temperature above freezing it should be again fanned and spread to dry, and this process repeated on the least indication of the presence of moisture.

In order to produce good sweet-corn seed one must be prompt to cut it when ripe, husk it as early as possible, and immediately get it under shelter where it will be exposed to every wind that blows until it is thoroughly dry, using every hour of bright sunshine in order to accomplish this before freezing weather.

AVERAGE YIELD OBTAINED AND PRICES PAID.

The return of usable seed varies greatly, and is affected not only by the variety and the weather, soil, and cultural conditions, but by the care with which the crop is gathered and cured. A seedsman

to whom a surplus is not objectionable will contract on a basis of 5 or 6 acres of the earlier, lighter-yielding sorts and 3 or 4 acres of the larger kinds per 100 bushels wanted; but one to whom a shortage is preferable to a surplus will limit his contracts to 3 or 4 acres of the earlier and 2 or 3 acres of the larger sorts per 100 bushels wanted. In both cases allowance is made for the liability of total failure of some of the crops.

The prices paid for growing vary greatly with the season, being much lower after seven fat years than after seven lean ones; at present they range from 70 cents to $1.15 a bushel of 50 pounds for the easier grown sorts, and from $1.10 to $1.50 for the lighter-yielding sorts and for those requiring greater care in curing.

UNIT OF MEASUREMENT.

Although contracts are sometimes made per 100 pounds, the more common unit is the "struck bushel," which is assumed to weigh 50 pounds; but the actual quantity which the term stands for varies greatly, not only with the sort, but with the condition and character of both the stock and the sample, and ranges from as low as 37 pounds in a very dry sample of a choice stock of Evergreen or Country Gentleman corn to 53 to 56 pounds in a poorly cured sample of the Minnesota variety.

MINIMUM ACCEPTABLE VIABILITY.

The minimum percentage of viability accepted by seedsmen on growing contracts ranges from 75 to 85 in years of scarcity to 90 or even 95 in years of plenty. There is some excuse for this variation in the fact that corn of low viability at harvest often deteriorates quite rapidly and is practically worthless the second year, while that of high viability kept under favorable storage conditions will germinate nearly as well the second or even the third or the fourth year as the first, and in a short year there is little likelihood of the necessity of carrying over stock, while it is probable that a part at least of the crop in a full year will have to be carried until the next season. Seedsmen often claim the right to purchase, at a reduction in price corresponding to its inferiority, a crop of seed grown under contract which is below acceptable viability or which is so imperfectly cleaned as not to be suitable for seed.

GROWING STOCK SEED OF SWEET CORN.

The structure of the floral organs of the corn plant is such as to secure under normal conditions more or less complete cross-fertilization, and it has been found that there is liability to rapid loss of vege-

tative vigor in plants which are persistently self-fertilized. This, in connection with the fact that it is difficult, if not impossible, under ordinary farm conditions to prevent more or less cross-pollination, leads to methods and practices in growing stock seed corn which differ materially from those that give the best results with most vegetables. Instead of trying to isolate the stock blocks, it is suggested that they be located near the center of the largest available field of the variety and that the selection of breeding stock be made as follows:

First, formulate a very clear conception of precisely what an ideal plant of the sort to be grown should be, not only as to grain and ear, but as to stalk, leaf, husk, silk, and tassel, for this is essential to the raising of the best seed of the sort. With this conception in mind or, what is far better, clearly written out and illustrated by photograph, go into a field of the sort at the time the plants are coming into silk and mark with a string, or a bit of cloth, or in some way a number of stalks. It is wise to select at least a hundred plants which are as nearly alike and typical of the sort as can be found.

When the grain is in the dough state, assemble the marked stalks and, after stripping down the husks, very carefully select and tag those in which the ear and the grain are nearest to the ideal. The ears from each of these selected plants should be carefully numbered, dried, and stored. The next spring mark out, near the center of the largest available field of the sort, a block of 4, 9, or 16 square rods for each of the selected ears, and plant each block with seed from one of the selected plants.

It is wise in making the planting to reserve at least one-fifth of the seed on each ear, not only for replanting if necessary, but so that reference may be made to the exact character of the parent stock. When the corn is coming into silk, carefully go over the blocks and select those in which the plants in stalk, leaf, husk, silk, and tassel are most uniformly of the desired character, rejecting the plants which show the greatest variation, even if some of them, as will in all probability be the case, are among the most perfect plants in the field.

When the corn is passing into the dough state go over the selected blocks and, stripping down the husks, select the blocks in which the ears are most uniformly of the desired varietal character, rejecting as in the selection of the individual plants, all the ears, no matter how perfect they may be, from the blocks showing greatest variation. As a rule it will be best to select several blocks in order to avoid the loss in vegetative vigor which in the corn plant often follows too close breeding.

From the chosen blocks select a number of the most perfect ears, to be tagged, numbered, kept separate, and again planted in separate blocks the next season. The balance of the corn from the selected blocks can be gathered and the better ears bulked and used the following season for planting the field in which the seed blocks are to be located.

Working in this way, never losing sight of or changing the ideal varietal characteristics of the sort, always selecting from the most uniform lot, resisting the temptation to use an exceptionally perfect ear found in a variable block, one can in a few years establish strains which will be greatly superior in practical value to most of the seed now used.

THE GROWING OF GARDEN BEANS FOR SEED.

The bean plant, particularly if it be one of our garden varieties, is exceedingly sensitive to unfavorable conditions of heat and moisture. If the soil is damp, but not quite moist enough to secure good germination, the seed will "malt" or sprout and die; if it is only a little too wet the seed will germinate, but die without expanding its true leaves.

Young bean plants would be killed or permanently dwarfed by a drenching rain which would have no permanent effect upon a young plant of corn. If when the plants are in flower the supply of moisture is shortened, either by drought or by injury to the roots through too close or too deep cultivation, so that the plants wilt, be it ever so little, the pods will fail to fill, and it is very seldom that the later-maturing pods on the plant will be any better, even if more favorable conditions bring out an abundant bloom.

From the starting of the seed into growth to the storage of the ripened grain, beans are exceedingly sensitive to unfavorable conditions of moisture. In spite of this, seed beans will often prove a profitable farm crop on good land anywhere in the United States north of latitude 40° or 41° and east of the Dakotas. South of latitude 41° beans are so liable to injury by the bean weevil, and in much of the country west of central Wisconsin the crop is so likely to be cut off by dry, hot winds at the time the plants are in flower, that seed beans are rarely profitable for many successive seasons, though some very fine crops of seed beans have been grown in Minnesota and the Dakotas.

LIMA AND POLE BEANS.

Seed of Lima beans, as well as of pole varieties of garden beans, can be very profitably grown along the western coast of California, where the night winds from the ocean furnish the necessary moisture

and the crop seldom suffers from drenching rains. Of late years seed of garden bush beans has also been grown to some extent in northern California, where there is less liability to disease than in the bean-growing sections of the East, but, in general, California crops are grown on farms wholly devoted to growing seed rather than as a part of the regular rotation of mixed farming.

GARDEN BEANS.

Garden beans have developed into many quite distinct varieties adapted to different soils, and it is quite essential to their profitable culture as a seed crop that one plant the sorts best suited to his particular soil conditions. This can only be learned through test plantings of the different sorts.

It will generally be found that varieties with thick, fleshy pods, like the Valentine, do best on rich clay soils and are apt to fail on light sandy ones, where such sorts as the Long Yellow, which rarely succeeds on clay soil, would give their best crops. Generally the large, wax-podded sorts, like Kidney Wax, give their best returns on rich black lands, where the flat, green-podded sorts would be apt to "run to vine," with small return of seed. Most of the wax-podded sorts, particularly those with fleshy pods, require rich, strong, moist soils, while the smaller, flat, green-podded sorts will often give good returns on light, warm, sandy soils on which other kinds would do poorly.

SOIL AND CLIMATE.

Conditions of soil and climate often greatly modify the character of bean plants, particularly as to the size and smoothness of the leaves and the size, fleshiness, and color of the green pods and beans. The relative size and color of the dry seed are very largely affected by the climatic conditions at the time of ripening, but differences in these respects, even when they are continued for several seasons, are not transmitted in any appreciable degree through the seed.

Lima and other pole beans grown without poles in southern California for many generations take to poles as well and mature as early as the same sorts grown on poles in Connecticut. Certain diseases, such as anthracnose and rust, are often carried in the seed, and there is great practical advantage in the use of seed which is the product of healthy plants.

LOCATION OF BEAN CROPS FOR SEED.

The structure of the flowers of the bean seems to guard against cross-pollination as effectually as that of the flowers of the corn plant provides for it, and seedsmen do not generally ask that growers

shall isolate fields of different varieties, though they often insist that crops of different sorts shall be stored and handled in separate buildings.

The cultural methods which will give the best crop of seed beans do not differ materially from those used in growing beans for commercial purposes, and these methods have been so well and fully stated in Farmers' Bulletin 289 that it is useless to repeat them here. It may be well, however, to refer to some minor differences in cultural methods and requirements.

No matter how well founded may be the claim of some bean growers that with commercial beans greater profit will come from heavy seeding, certainly better seed beans can be grown by light seeding. There is a great difference in the quantity of seed needed with different varieties, 8 to 12 quarts to the acre being as liberal a seeding for a small-seeded but large-vined sort, like the Crystal White Wax, as a full bushel would be for some of the larger varieties, like the Flageolet. The cost of growing seed beans is somewhat increased by the work of "roguing" out the mixed and inferior plants, but when good stock seed is used there should not be more than one "rogue" plant to every 10 or 20 rods of drill; often there will not be more than one to 50 or 100 rods.

Many sorts of garden beans can be grown, gathered, thrashed, and fitted for market at less cost than field beans, and they generally yield fully as much to the acre; but other sorts, particularly some of the large, fleshy, wax-podded varieties, require richer soil and a great deal more care in curing and thrashing, and they generally yield less to the acre.

The labor necessary to thrash and clean seed beans is largely governed by weather conditions at the time of harvest. The appearance of the sample is very dependent upon the skill of the thrasher. The lot secured by one man will contain so many split beans, and those covered with sections of pods, that it can not profitably be made fit for seedsmen's use, while another man with the same machine will secure a fairly clean lot from the same crop. The labor and skill necessary to obtain a good result are also quite dependent upon the variety.

The pods of some of the very fleshy, wax-podded sorts shrink down about the beans and in thrashing break so as to leave many of the beans incased in sections of the pod. It is sometimes necessary to run the seed of such sorts through a "rubber" made of a cylinder, with many teeth about one-fourth of an inch long and three-eighths of an inch in diameter, revolving comparatively slowly against concaves covered with ribbed rubber or very coarse, heavy canvas. On account of the difficulty in growing and thrashing some

varieties, seedsmen should, and commonly do, make a difference in the prices paid, though often this difference is not sufficient to balance the actual difference in the cost of growing, thrashing, and recleaning.

YIELD PER ACRE AND PRICES PAID.

As with sweet corn, the yield varies greatly with the variety, season, soil, and the skill and carefulness of the grower. It ranges from 10 to 30 bushels per acre, with phenomenal yields up to 40 or even 60 bushels, a yield of 10 bushels being comparable as to quantity with one of 18 to 20 bushels of wheat. Seedsmen generally base the area contracted for on a yield of 8 to 12 bushels to the acre.

The prices paid farmers for growing beans vary with the season and are more influenced by the ruling prices for commercial beans than is the case with corn. At present they range from $1.30 to $2.30 a bushel for the sorts which are most easily grown and thrashed, and from $1.50 to $2.50 for those which require greater care and labor. Prices for growing Lima and pole beans range from $2.75 to $4 a bushel.

UNIT OF MEASUREMENT.

The unit of measurement in farmers' contracts for growing beans is usually a nominal bushel of sufficient weight to leave 60 pounds after all cleaning and hand picking necessary to make the beans fit for seedsmen's use. There is, however, a difference, sometimes amounting to from 5 to 10 per cent, in the actual weight of the same bulk of equally clean and well-cured lots of different varieties.

MINIMUM ACCEPTABLE VIABILITY.

The minimum percentage of viability accepted by seedsmen on growing contracts varies somewhat in different seasons and with different varieties of beans, and runs from 80 to 95 per cent. There is less excuse for variation in the percentage of acceptable viability with beans than with corn, for beans usually grow as well the second season as the first, and a large proportion of the beans which are not viable will be removed in hand cleaning.

Their appearance is an important factor in determining the acceptability of beans, and any distinct stain or discoloration on as many as 8 or 10 per cent of the beans justifies their rejection, even if they be of high viability. Seedsmen claim the right to purchase, at an equitable reduction in price, beans grown under contract which from discoloration or want of viability are not acceptable on the terms of the contract.

GROWING STOCK SEED OF GARDEN BEANS.

In growing stock seed of garden beans, even more than with corn, the first requisite is a very clear conception of what constitutes an ideal plant of the sort, and this should extend to all of its parts, for very often the first indication of an accidental crossing which will ultimately ruin the stock is in some slight change of no economic importance. In the bean plant the result of crossing is seldom seen in the seed, and sometimes is not noticeable in any part of the plants which are the immediate product of the cross. Generally, crossing is first manifested in some inconspicuous way, such as in the size or the color of the flower, in the form or the tint of the marking of the seed, or in the shape or the color of the point of the pod; but these are premonitions of changes in subsequent generations which will render the stock worthless and which it will be practically impossible to eradicate by the most careful roguing.

In starting a foundation stock one should most carefully select a few plants which in habit of growth, in leaf, flower, pod, and in every way are of the exact varietal character wanted. The seed of these selections may with reasonable safety be planted side by side, but each plant should be carefully examined, and the whole of any lot in which a single plant shows variation that seems to have come through the seed rather than as a result of more or less perfect development should be rejected, and it is often wise to reject all of the stock that traces to the same original selected plant. In making such rejections it is very important that one should distinguish between variations which were transmitted through the seed and those which result from conditions of growth and which would not be carried in the seed. This will call for the exercise of wise judgment founded on a full and accurate knowledge of the varietal characteristics of the sort. It will be seen that in spite of the lesser liability to cross-fertilization, the building up of a true stock is a much slower process with beans than with corn, but when one which is true has been secured it is much easier to keep it so.

THE GROWING OF GARDEN PEAS FOR SEED.

Peas are closely related to beans botanically, and the general climatic and soil conditions requisite for the best development of the two are very similar. Peas require for their most profitable development a cool, moist climate, and they can not be profitably grown in a hot, dry one or where there is a liability of such conditions occurring for even a few consecutive days. Clear, bright weather free from drenching rains is essential to the ripening and curing of the seed. It not infrequently happens that because of wet and catchy weather

at harvest time the seedsman fails to get any usable seed from fields of peas which had given promise of a large yield.

The sections where seed peas can be profitably grown are still further limited by liability to injury from the pea weevil. Injury from this insect is less common north of latitude 42° to 43° than farther south, and crops grown on clay soils, particularly if they be near large bodies of water, suffer less than those grown on sandy soils. For these reasons the growing of seed peas in America is generally confined to the sections bordering on the Great Lakes and to a few locations in Washington, Oregon, and northern California where the climatic conditions are favorable.

There is no garden vegetable in which uniformity in habit of growth and in the maturing of the fruit in all the plants of a culture[a] is of greater importance than with green peas. The character of the plant and the cultural methods commonly employed in growing it are such that the gathering of the first one or two pickings of green pods is likely to so check the growth of the plants that the later maturing pods are decidedly injured, often so much so as to make the picking of them for culinary uses unprofitable. Again, the good appearance of the pods in the basket is very dependent upon evenness of form and maturity, a comparatively slight difference in the form or the age of a few pods ruining the effect of the whole. Lastly, any overripe or "off-colored" pea is made more conspicuous and objectionable by cooking.

For these reasons, evenness in size of plant and in date of maturing is a more important element of value in garden peas than in most other vegetables.

CULTURAL REQUIREMENTS.

The pea plant, like that of the bean, is very materially influenced as to habit of growth and maturity by soil conditions, and in the pea changes due to this cause are transmitted through the seed seemingly with cumulative force. It is consequently very important that all of the plants of a "culture" for seed should be as nearly uniform in size and maturity as possible. Often a field which has been recently cleaned of forest or one which has been heavily manured will yield a large crop of seed, which, however, will not be of the best quality because of lack of uniformity in the size and in the earliness of the producing plants.

The best crops of seed peas, as regards both quality and quantity, can usually be grown by turning under old timothy sod on a uniform, well-drained, clay or clay-loam soil. Uniformity in character of the

[a] A single planting of the same sort.

soil on which the crop is to be grown is not of greater importance than that its preparation should be such as to put it into good tilth and to make it as even and uniform in composition and physical condition as possible, and the seed should be so planted as to secure evenness in germination and in the growth of the young plants.

No plant responds more readily to good preparation and culture of the soil than the pea, but its habit of growth and the cultural methods used are such that thorough preparation should be given before the seed is put in the ground.

Not only the growth of the plant but the harvesting of the crop in good condition is very dependent upon favorable weather, and in most sections of this country where seed peas are largely grown there is much more likelihood of the early-planted crops escaping unfavorable conditions than those which are planted later. It is therefore very desirable that the seed should be sown as early as the ground can be put into good condition, and it will generally be desirable that the field, particularly if it be in sod, be plowed in late fall or early winter, which would have the further advantage of destroying many cutworms and other injurious insects. The ground should be worked and the seed sown as early in the spring as possible, but one should not permit the desirability of early planting to tempt him to sow before the ground has had the best possible preparation.

QUANTITY OF SEED TO USE PER ACRE.

The quantity of seed to use to the acre will depend upon the variety and, in some cases, upon the soil and location. There is a great difference of opinion as to the quantity of seed which will give the most profitable returns, and that recommended varies from 80 to 160 pounds for such small-seeded, large-vined sorts as the Admiral, and from 120 to 180 pounds for the larger-seeded, short-vined kinds like the Yorkshire Hero. The writer believes that the best seed can be grown by comparatively thin seeding.

In some sections of the country, from Dakota westward, pea vines show a much greater tendency to branch from the bottom than the same stocks would if planted in the East, so that in Washington and California as good results can often be secured from the use of only 20 to 40 pounds of seed as from the larger quantities that eastern growers think it necessary to use.

Great care should be taken to secure even distribution and covering of the seed. This can generally be accomplished best by the use of some form of grain drill, but care should be taken to select one that will not crack the seed. It will often be desirable after sowing to run over the field with a light slanting-tooth harrow, but if this is

done it should be so timed as to avoid either uncovering the seed or injuring the germinating plants.

ROGUING.

While experience has demonstrated that it is practically impossible to materially improve a stock of peas by roguing, this method is often resorted to by many growers in order to secure so-called pure stock. Roguing is of less value with peas than with beans, because the greater number of plants to the acre and the irregularity of arrangement and growth make it a practical impossibility to critically examine every plant, or even a large proportion of the plants of a field, and very often a crossed or "off" plant can not be distinguished even by careful examination, yet the seed of that plant may the next season develop into plants which are very objectionable. Again, there is always a possibility, it might even be said a probability, that the blossoms of a plant so conspicuously "off" that the roguer sees and removes it had already contaminated from one to a score or more of the surrounding plants, so that their product would be seriously "off" the next season.

In practice, the most that one can hope to accomplish by roguing seed peas is to prevent the stock from deteriorating still further, the only hope of securing a pure or improved stock being in selecting and breeding from the best rather than in eliminating the poorest.

While roguing should not be depended upon, especially for the growing of stock seed, it should not be neglected. The fields should be carefully gone over at the time when the earliest plants are passing out of bloom. Each man should take a strip of a certain width and, moving with his back to the sun, confine his attention to that strip, removing all of the rogues seen there and resisting the temptation to go foraging to the right or the left; and he should return over the same strip, scanning it as carefully as at first, for very often a rogue which was not noticeable when looking with the sun is very evident when looking in the opposite direction.

GATHERING AND CURING.

The commercial value of seed of garden peas is largely influenced by the appearance of the seed, and this is very dependent upon the conditions and the care used at the time of harvest. With many sorts it is desirable that the seed should retain a green shade, and that it may do so, as well as to prevent loss from shelling, the vines should be gathered as soon as the bulk of the crop is hard and before any of the ripest pods begin to shell or have been bleached by the sun.

The best plan of harvesting will depend upon the variety grown, the weather conditions, and the kind of labor, and of farm machinery available. Where the low-priced labor of women and boys can be obtained, the very dwarf sorts, like American Wonder, can often be most economically gathered by hand into bunches of 2 to 4 cubic feet. The next larger-sized sorts can be gathered with a sharp hoe, a short scythe, or a pea rake (see fig. 3) into bunches of about the same size. The larger-vined sorts can be "rolled" into bunches of 4 to 8 cubic feet with a short scythe or cut with a mower carrying "pea guards" on the cutting bar, so as to raise the vines and prevent cutting the pods, and then be gathered into windrows or bunches.

While in the field, the bunches should be turned every two or three days and after every rain, in order to hasten the curing and to prevent the rotting or the bleaching of the seed. In order to avoid loss of color or injury from rain, it is desirable that the vines be well stacked or put into barns as soon as they are so dry that they will not mold or spoil in the mow. The vines should remain in the mow until they are well cured and can be easily and conveniently thrashed.

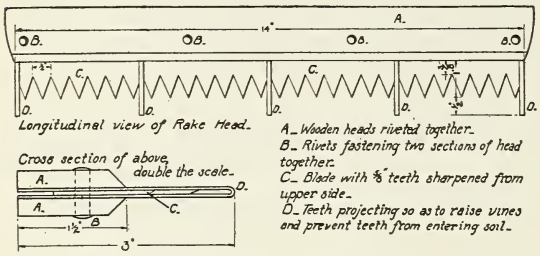
A.
B.
C.
D.
Longitudinal view of Rake Head.
Cross section of above, double the scale.
A_Wooden heads riveted together.
B_Rivets fastening two sections of head together.
C_Blade with ⅝" teeth sharpened from upper side.
D_Teeth projecting so as to raise vines and prevent teeth from entering soil.

FIG. 3.—Sketch of head of pea rake for gathering short-vined peas.

The smaller-vined sorts can usually be thrashed most economically by flails. The larger-vined varieties are best thrashed by an ordinary bean thrasher with part of the concave teeth removed, but it should be so managed and run as to prevent splitting the peas. Skillful handling of the thrasher is quite as important with peas as with beans.

YIELD TO THE ACRE.

The yield of salable seed peas is very dependent not only upon the crop grown but upon the proportion of it one can secure in salable condition. It often happens that through a little delay in harvesting from 10 to 40 per cent of the seed is lost through shelling in the field. Again, a few days of rainy weather may cause the loss of even the entire crop through sprouting and rotting in the field. Lastly, there may be a very heavy loss through the splitting of the seed in thrashing. The yield also varies greatly with the variety.

Under favorable conditions one may hope to harvest from 10 to 30 bushels to the acre, and the most productive sorts may yield up to 60 bushels under favorable conditions. Seedsmen generally contract on

a basis of a return of from five to eight times the quantity of seed planted, this basis allowing for the total failure of some of the plantings.

PRICES PAID.

The prices paid for growing seed peas vary greatly with the variety and run from 70 to 95 cents a bushel for some of the easiest grown sorts after a few years of full crops to $1.75 to $2.50 for the dwarfer vined and less productive sorts after a few seasons of light yields.

UNIT OF MEASUREMENT.

The common unit of measurement for peas is the same as for beans, i. e., a "bushel" of sufficient weight to leave 60 pounds after the necessary cleaning and hand picking. There is a greater difference in the weight of the same bulk of different varieties of peas than of beans. Some of the wrinkled sorts weigh only 50 pounds to the bushel, while the smaller, smooth sorts weigh from 58 to 64 pounds. Clean, bright seed is desirable, but it is not so essential as with beans. Any conspicuous injury from the pea weevil or other insects or any discoloration or splitting of the skins in the field or of the grains in thrashing is regarded as justifying the rejection of the crop as not suitable for seedsmen's use.

MINIMUM ACCEPTABLE VIABILITY.

Seedsmen seldom are obliged to reject because of poor germination, otherwise acceptable lots of peas grown on contract. A properly-cleaned sample will rarely show less than 85 or 90 per cent of viability shortly after harvest, though where the plants have been seriously injured by lice or in some other way the seed sometimes loses in viability quite rapidly.

GROWING STOCK SEED OF PEAS.

Stock seed of peas should be selected and grown in the same way as that recommended for beans. With peas, however, variations due to soil and cultural conditions are transmitted through the seeds, so that care should be taken to grow stock to be used for seed on soils which are uniformly favorable for the best development of the particular variety. Peas are also more liable than beans to crossing through the action of wind or of insects, and for this reason it is not wise to grow stocks of different sorts side by side. They should be either isolated or located in a field of the purest available stock of the variety.

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